

## REMARKS

No Claims were deleted. None was added. No fees are due. If the Office disagrees, it may charge Deposit Account No. 07-1077 for the payment.

### §112, First Paragraph Rejection

Applicants acknowledge that the Office considers Claims 1 and 9 too broad and that undue experimentation would be required for the Office's enumerated reasons stated in the rejection. As such, the Office must be seen as also taking the position that the art of thermoplastic elastomers and the catalyst systems used for their formation is an *unpredictable art* filled with many uncertainties.

Applicants therefore have amended Claims 1 and 9 to limit their claimed invention to the thermoplastic elastomer which what 110 experiments have shown: EPDM is cured or crosslinked in the presence of a specific catalyst system. Moreover, Examples 104-110 show the formation of a thermoplastic elastomer of polypropylene and EPDM where the EPDM is crosslinked or cured in the presence of the polypropylene. Thus, the thermoplastic elastomer is a thermoplastic vulcanizate, as defined in the Embodiments section of the application. For that reason, and to be even clearer, Claims 1 and 9 are amended to claim a thermoplastic vulcanizate, relying on the definition in the Embodiments section of the application.

Support for these amendments are found throughout the application, but especially in Table 1 and Tables 25-27.

This amendment overcomes the §112 rejection but also foreshadows why Applicants' claims are allowable over the cited art.

### §112, Second Paragraph Rejection

The Office seeks clarification in Claim 9 concerning the phrase "thermoplastic elastomer." Applicants believe their amendments clarify the

language of Claim 9. Applicants have itemized their five steps of the process to form the thermoplastic vulcanizate and itemized their catalyst system (three types required and one type optional.) Also, Applicants have made plain that the heating step (e) in the presence of the catalyst system causes the uncured EPDM in the presence of the polypropylene to cure and form the thermoplastic vulcanizate. With these amendments, the word “vulcanizate” is distinguished from “elastomer” in a manner consistent with the definitions in the Embodiments section of the application. These amendments clarify Claim 9 to satisfy §112.

[§103 Rejection using U.S. Pat. No. 4,311,628 \(Abdou-Sabet et al.\) and U.S. Pat. No. 5,962,608 \(Ryang et al.\)](#)

Applicants agree with the Office that Abdou-Sabet et al. do not teach using chloride salts of magnesium, calcium, sodium, or potassium when making a thermoplastic elastomers, or more particularly, the subset category of thermoplastic vulcanizates.

Ryang et al. do not supply what Abdou-Sabet et al. lack. Keyword searching of Ryang et al. reveals that Ryang et al. is never concerned with thermoplastic elastomers. There is no mention of EPDM or thermoplastic vulcanizates. The phenolic resins discussed by Ryang et al. are designed to serve as the thermoplastic resin, not a member of a catalyst system for the curing of EPDM in the presence of polypropylene to form a thermoplastic vulcanizate.

The fleeting presence of metal halides in the process of making a metal oxide precursor in order to make a metal oxide sol in order to make a polymer can hardly be viewed by any person having ordinary skill in the art (PHOSITA) as the missing element in Abdou-Sabet et al. to replace tin-based catalysts with the claimed catalyst system which happens to use Group I and Group II metal chloride salts as ONE of the catalysts in the catalyst system.

There is nothing in Ryang et al. to make it obvious to PHOSITA to take anything from Ryang et al. and fill a gap in what Abdou-Sabet et al. teach. Ryang et al. is making polymers from metal oxide sols. PHOSITA would not take a precursor of a precursor from Ryang et al. and consider it obvious to use with what Abdou-Sabet et al. has taught in the making of thermoplastic vulcanizates.

As the Office itself has implied, Applicants can confirm. The art of thermoplastic elastomers is unpredictable. One should not suppose a result without an experiment. In this unpredictable art, who would have thought that a catalyst system of three required types and one optional type would be able to supplant the industry standard (Abdou-Sabet et al.) which unfortunately relied upon tin-based catalysts which Applicants strive to avoid?

Claims 1, 3, and 9-12 are patentable over the combination of Abdou-Sabet et al. and Ryang et al. because that combination is defective as proof of obviousness to PHOSITA.

§103 Rejection using U.S. Pat. No. 4,311,628 (Abdou-Sabet et al.) and U.S. Pat. No. 5,962,608 (Ryang et al.) and U.S. Pat. No. 2,726,224

Claim 13 is just as patentable over this combination as Claims 1, 3, and 9-12 are over the prior combination and for the same reasons.

§103 Rejection using U.S. Pat. No. 3,287,440 (Giller et al.)

The patent to Giller et al. appears to have brought to the art the use of phenol-aldehyde resins to crosslink unsaturated copolymers or EPDM. In the recitation of what was “known”, Giller et al. refer to Group II metal halides and phenol resins as a means to vulcanize elastomers. (Col. 1, Lines 25 et seq.) Applicants agree that Group II metal halides include magnesium chloride and calcium chloride.

Giller et al. issued in 1966 and was published earlier than that in Europe. So, there has been a passage of nearly 40 years before Applicants filed their patent application.

At Col. 7, Line 48 et seq., Giller et al. taught the use of “stearic acid, palmitic acid, myristic acid, or lauric acid” as useful in the compounds.

Then at the Examples, Giller et al. returned to focus their experimentation, in this unpredictable art, on their preferred halide, stannous halide, which Applicants invented their catalyst system to avoid, and stearic acid.

In Claims 1 and 9, Applicants have claimed stearic acid ( $C_{18}$ ), along with oxalic acid ( $C_2$ ) and citric acid ( $C_6$ ). Applicants have amended Claims 1 and 9 to delete stearic acid from their list of acids to be used in the catalyst system, in order to clarify their claimed invention and to patentably distinguish over Giller et al.

The list of “stearic acid, palmitic acid, myristic acid, or lauric acid” taught by Giller et al. leads PHOSITA toward a high carbon fatty acid (at least  $C_{12}$ ). Applicants focus their invention on the use of low carbon acids.

Examples by Applicants bear out the value of the use of either oxalic acid (Examples 72 and 74) or citric acid (Examples 73, 75, 104, and 107-110).

Because the art of thermoplastic elastomer dynamic vulcanizing is unpredictable, there is nothing in Giller et al. which would have taught PHOSITA to employ oxalic acid or citric acid as acids to be used in the conversion of EPDM from an uncured elastomer to a cured rubber.<sup>1</sup>

Therefore, even after almost forty years after a disclosure of a catalyst system of phenolic resin + Group II metal halide +  $C_{12}$  or greater fatty acid, no PHOSITA came along and found that citric acid or oxalic acid could be used in

<sup>1</sup> It should also be noted that Abdou-Sabet et al. (who came 11 years later than Giller et al.) do not disclose either oxalic acid or citric acid.

that catalyst system claimed by Applicants. For that reason, Applicants are entitled to allowance of their amended claims over Giller et al.

Conclusion

Applicants have amended their claims and presented these remarks to a non-final rejection of their claims to advance their application to allowance. If there are any matters which the Office finds to prevent a Notice of Allowance in response to these amendments and remarks, the Office is invited to contact the undersigned by telephone.

Respectfully submitted by:

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